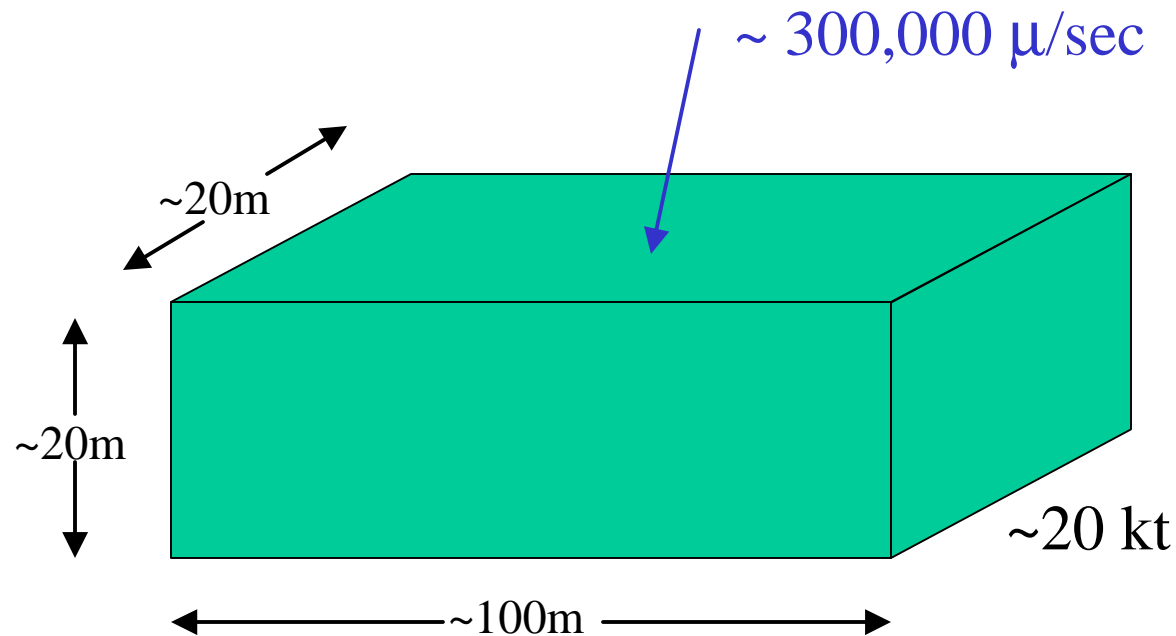


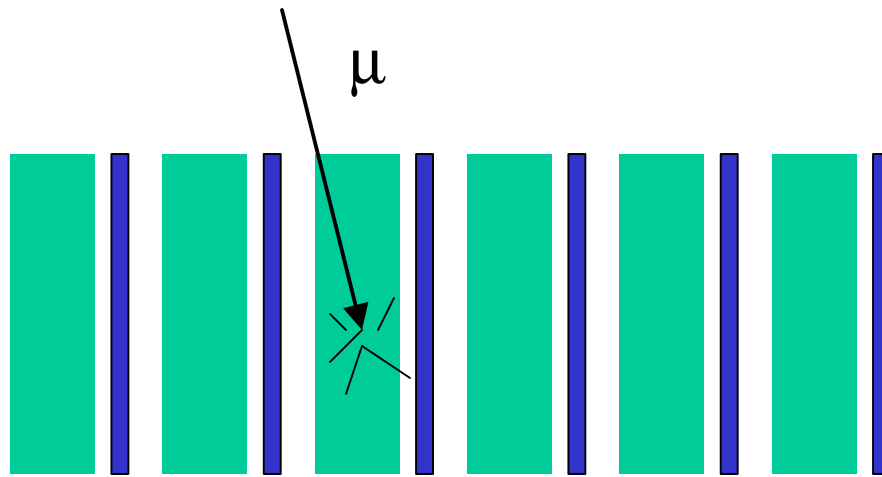
Cosmic Ray Backgrounds for an off-Axis Detector

Cosmic Flux for Surface Detector



In 100 kt-yr, expect about 40 intrinsic beam ν_e

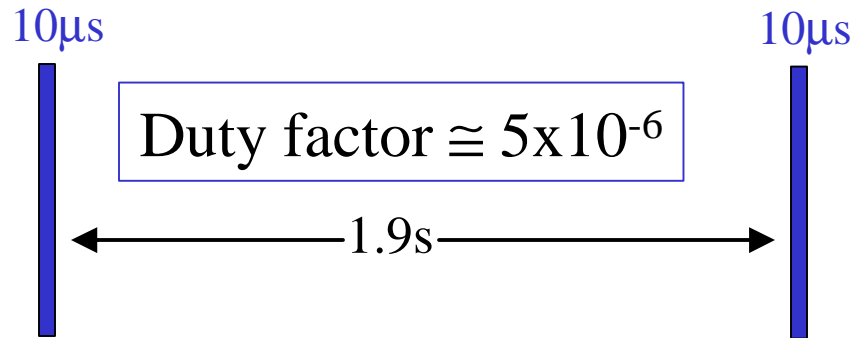
What Are We Afraid Of?



Neutrons? x , γ , π^0 ? Decay? Mis-ID?– The UNKNOWN

- Can this detector work on the surface?
- Will we need an external veto?

Duty Factor



In 5 calendar years, we will
be live for
 $\sim 50\% \times 5\text{yr} \times 5\text{E-}6 \times 3.2\text{E}7$
or ~ 400 seconds
 $\Rightarrow 120$ million muons

We need rejection of order 1 in 10 million
to reach intrinsic ν_e level

*$\sim 100x$ worse if we
ever go to resonant
extraction (1-2ms)....*

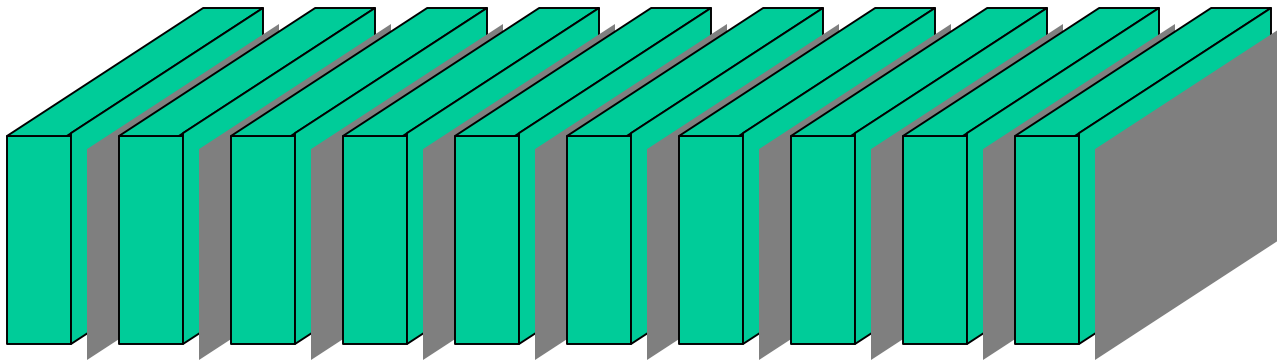
What Do We Already Know?

- Scale: need ~ 1 in 10 million rejection
- Beyond confidence regime of simulations
 - Specific values of inefficiencies, correlations, physics parameters
 - Unanticipated processes, conspiracies
- Experience of previous experiments
 - Different energy range than proton decay
 - Needs to be studied for our choice of geometry, absorber, detector.
 - Input welcome! MACRO, SK?

Cosmic Background Studies

We can use a “small” detector

5×10^{-6} duty factor



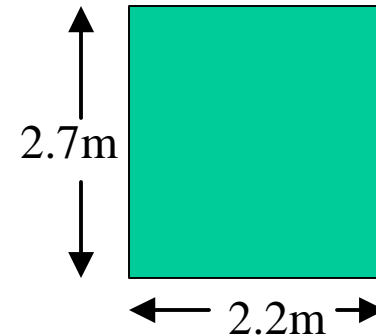
- 20 ton detector taking data continuously for 1 year
- Compare “50 kt-yr” with beam – *really 0.25 ton-year*

Regardless of insight from simulation and previous experiments, such a study is quite feasible and affordable

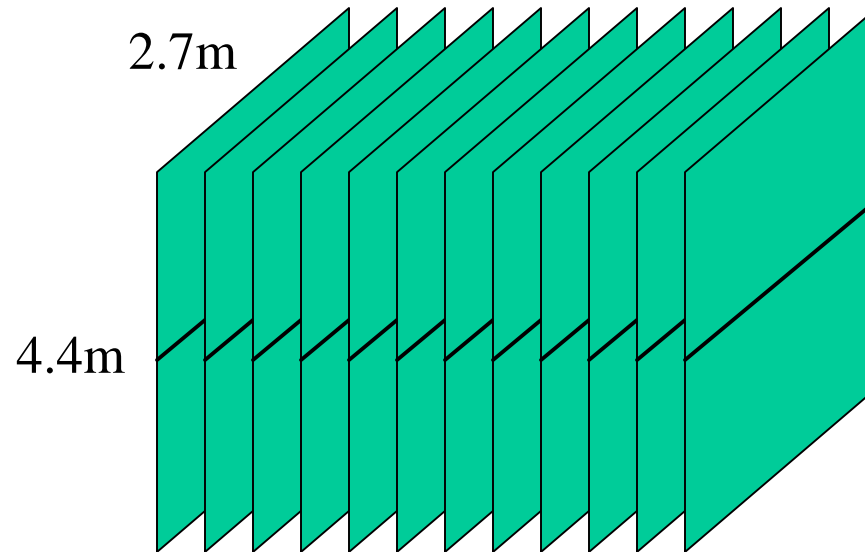
Cosmic Background Studies

20 RPCs from Virginia Tech (Belle)

See talk by
C. Hagner



E.g., pairs of planes:
1/3 X_0 plastic between
10 planes x 0.15 m
 \Rightarrow ~ 20 tons of plastic



Issues

- Small fiducial region
 - Should be sufficient statistics for as long as fiducial more than 25%
- Only $\sim 3X_0$ – electrons can traverse length
 - How good is μ/e separation without using track length?
 - Electrons aren't terribly “shower-like”
 - Can change aspect of detector to study this if we see any potential background.

Status

- Small RPC test stand started at lab 6 at FNAL
 - LODEN test project
- 20 Belle RPCs will arrive soon
- Upcoming work
 - Build appropriate DAQ
 - Choose and build readout strip construction
 - Engineer infrastructure for 20 ton detector
 - Gas, mechanical
 - Procure plastic

Summary

- Surface detector will see 100s of millions of muons during live time
- Need to understand whether these can lead to backgrounds on scale of 40 events
- Direct measurement is surest path forward
- Project to study backgrounds in low density RPC detector at Lab 6:
 - 20 ton detector will give valuable feedback with 1 year of running.